

# YOU MAKE **CONNECTED** GADGETS

Eric Tsai



eric\_1100

[GitHub.com/TsaiTsai/LoRa-Tooth](https://github.com/TsaiTsai/LoRa-Tooth)

(so you don't have to take notes)

WHAT ARE WE MAKING?

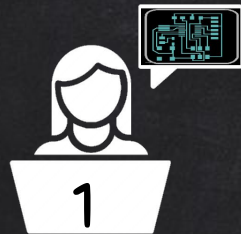
HOW ARE WE MAKING IT?

Gateway

Battery Powered Wireless  
Sensor (Thread)

Phone App

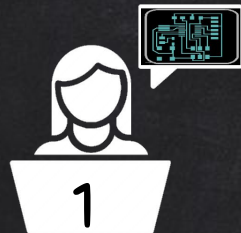




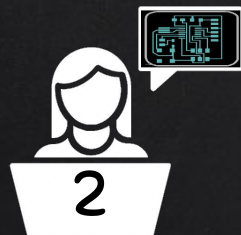
1

## SOM + Carrier board + Radio

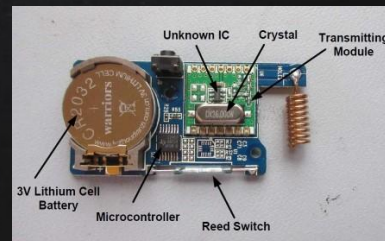




## SOM + Carrier board + Radio



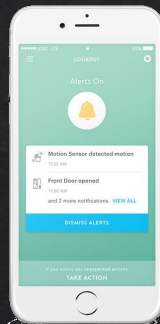
## Module + carrier board







Linux BSP  
Drivers  
Build System  
Applications  
Wireless firmware



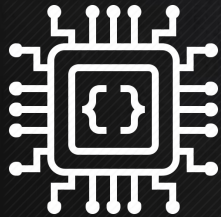
# MAKING BATTERY-POWERED SENSORS

...AT HOME

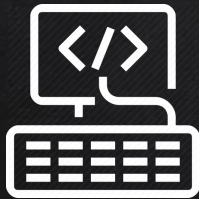
...BY YOURSELF

...OVER THE WEEKEND

Hardware



Software



Supply Chain

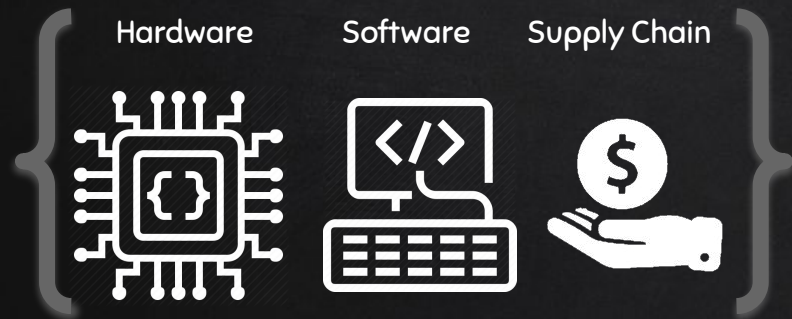


# MAKING BATTERY-POWERED SENSORS

...AT HOME

...BY YOURSELF

...OVER THE WEEKEND



*Maximum Makability :*

As many people as possible can make



Store: **AND TECHNOLOGIES CO LTD**

Open: 7 year(s)

98.9% Positive feedback

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**AND****NRF51822-QFAA 256k  
flash/16K RAM****4.0  
Bluetooth®**

- Chip: NRF51822(AA)
- Pitch: 1.27mm
- Operating voltage:
  - 1.8 V ~ 3.6 V, 3.3V recommended
- Communication distance : 60m~80m

🔍 Mouse over to zoom in

**Core51822 BLE 4.0 Bluetooth 2.4G Wireless Module nRF51822 Antenna Board  
For ULP SPI I2C UART Interface Compatible NRF24L Series**

★★★★★ 5.0 (17 votes) | 23 orders

Price: **US \$4.50** / piece

Bulk Price

Shipping: **US \$1.55 to United States via AliExpress Standard Shipping**

Estimated Delivery Time: 19-39 days

Quantity:  piece (4768 pieces available)Total Price: **US \$6.05**

Buy Now

Add to Cart

👤 Add to Wish List (141 Adds)

Return Policy Returns accepted if product not as described, buyer pays return shipping fee; or keep the product &amp; agree refund with seller. View details

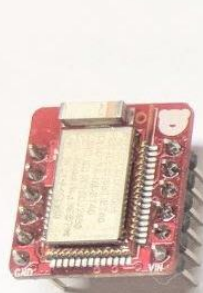
Seller Guarantees: On-time Delivery  
**60 days**

Payment:



Recently Viewed

# A BUFFET OF CHEAP BLE MODULES



\$16

Redbear Labs Nano



\$29

Nordic Beacon Kit



\$5

"Button Beacon"



\$5

"Hard To Solder"



\$5

"Even Harder to Solder"



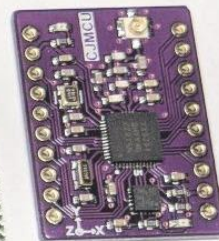
\$5

"Small and Useful"



\$5

"Lots of Pins"



\$6

"Bread Board Friendly"



ebay / Aliexpress

Nordic nRF51822 BLE modules



Shop by category ▼

Search for anything

All Categories ▼

Search

Back to home page | Listed in category: Business & Industrial > Electrical & Test Equipment > Electrical Supply Equipment > Enclosures, Panels & Boards > Electrical Panels & Boards > See more Version NodeMCU Lua Esp8266 Cp2102 WiFi Intern...

Saved in your Watch list | Remove | Buy it now to make it yours!



## NEW Version NodeMcu Lua ESP8266 CP2102 WIFI Internet Development Board Arduino

★★★★★ 30 product ratings

Condition: **New**

Quantity:

More than 10 available  
**5,257 sold** / See feedback

Price: **US \$3.57**

**Buy It Now**

**Add to cart**

✓ Watching

**A seller you've bought from**

5,257 sold

30-day returns

Shipping: **FREE** Economy SpeedPAK from China/Hong Kong/Taiwan |

[See details](#)

See details about international shipping here. ⓘ

Item location: Hong Kong, China

Ships to: Americas, Europe, Asia, Australia [See exclusions](#)

### Seller information

**chivazhu** (72986 ★)  
99.4% Positive feedback

♥ Save this Seller

Contact seller

Visit store

See other items



# LEVERAGE PLATFORMS - HARDWARE



Raspberry Pi, \$40



ESP8266, \$5



nRF51822 BLE Module, \$5

# MQTT TUTORIAL

## Publish-Subscribe Message Protocol over TCP/IP

Subscriber:

```
>mosquitto_sub -h localhost -v -t '/state/city/condition'
```

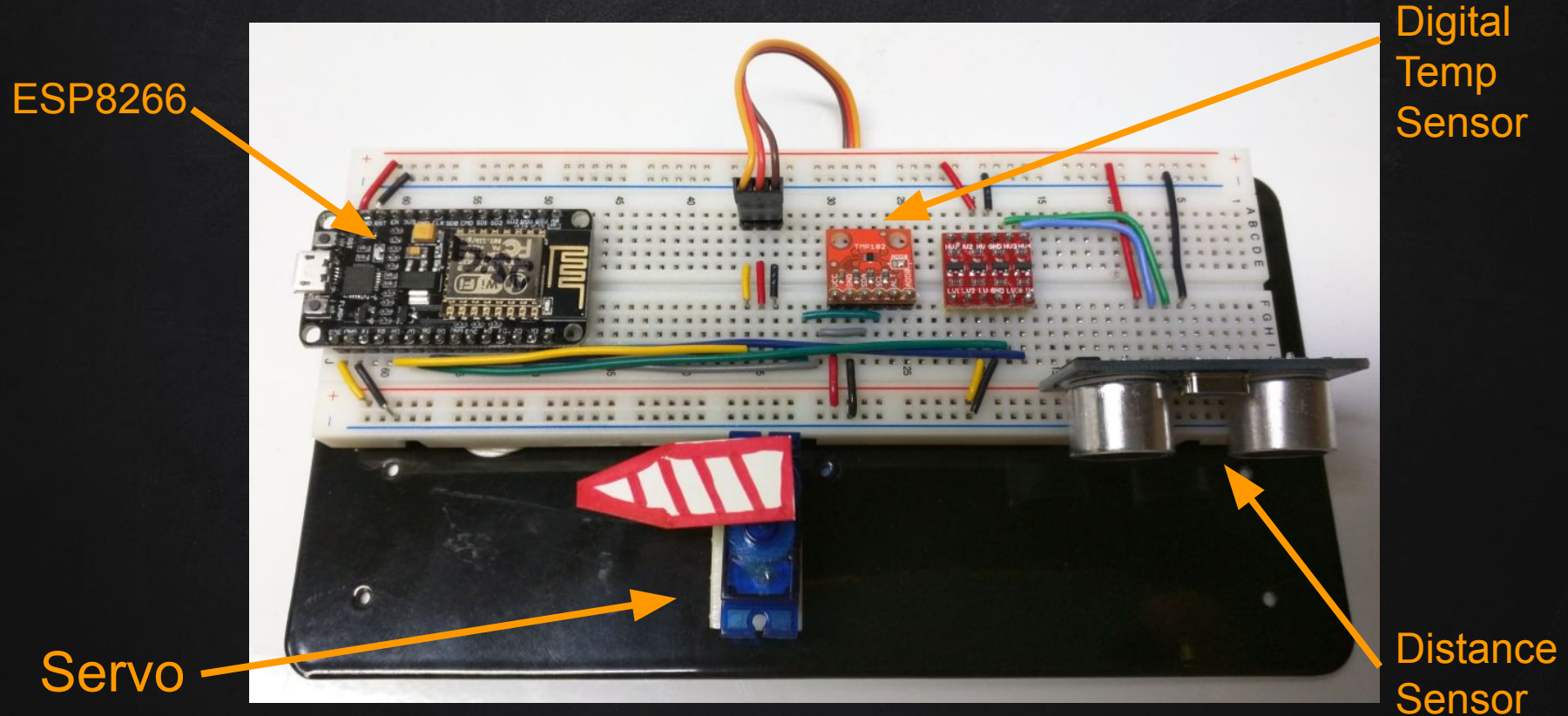
```
>mosquitto_sub -h localhost -v -t '/+/springfield/#'
```

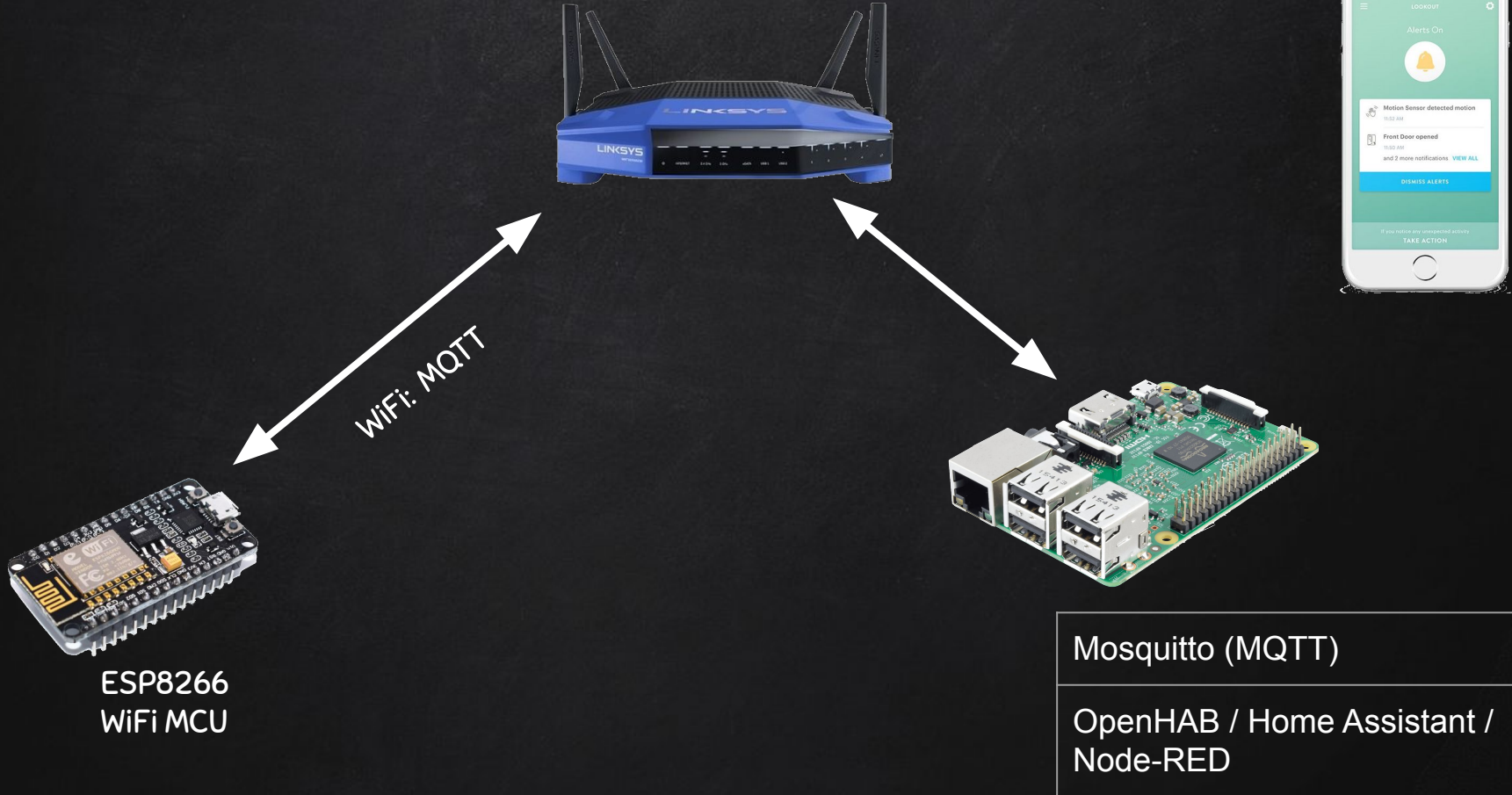
Publisher:

```
>mosquitto_pub -h localhost -t '/state/city/condition' -m 'xxxx'
```



# Wifi MQTT Gadget

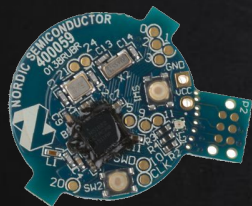




# BLE to MQTT Bridge

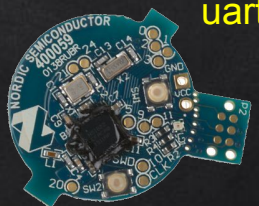
31-byte BLE advertisement

11:11:11:XX MAC 6	3.14 Volt 4	211 xmit_cnt 1	{"xxx":2332} JSON [variable]
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Sensor

Bluetooth



BLE-JSON

uart

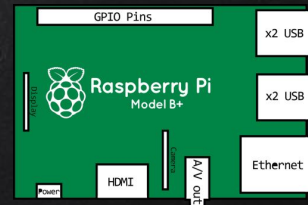


JSON-MQTT

```
{"mac":"c56e806d7cfb","rssi":-44,"volt":3.14,"tmr":1750,"xmit_cnt":211,"mag":1}
```

```
/ble/Garage/c56e806d7cfb/rssi -44  
/ble/Garage/c56e806d7cfb/volt 3.14  
/ble/Garage/c56e806d7cfb/mag 1
```

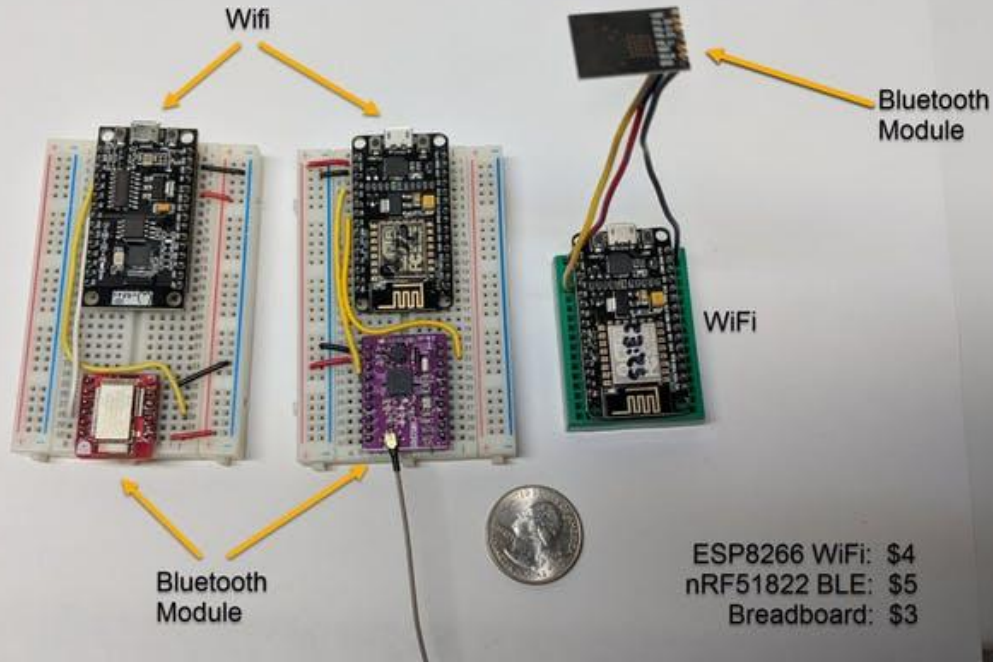
```
/ble/Kitchen/c56e806d7cfb/rssi -44  
/ble/Kitchen/c56e806d7cfb/volt 3.14  
/ble/Kitchen/c56e806d7cfb/mag 1
```



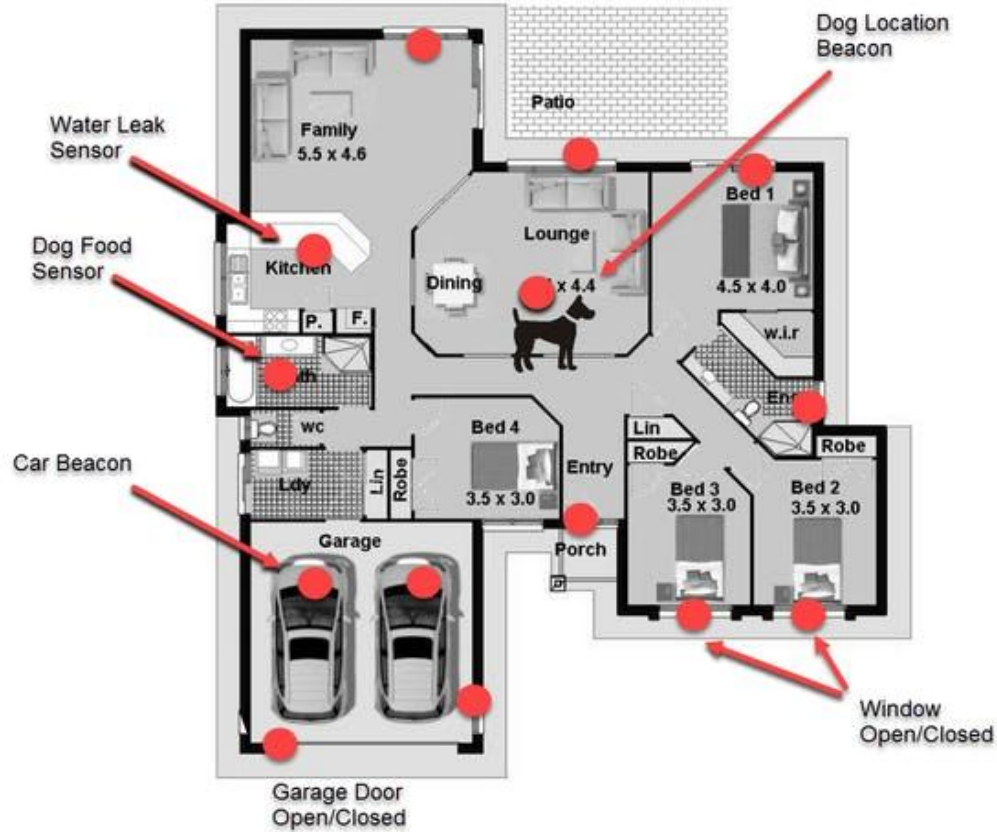
WiFi- MQTT

# BLE to MQTT Bridge

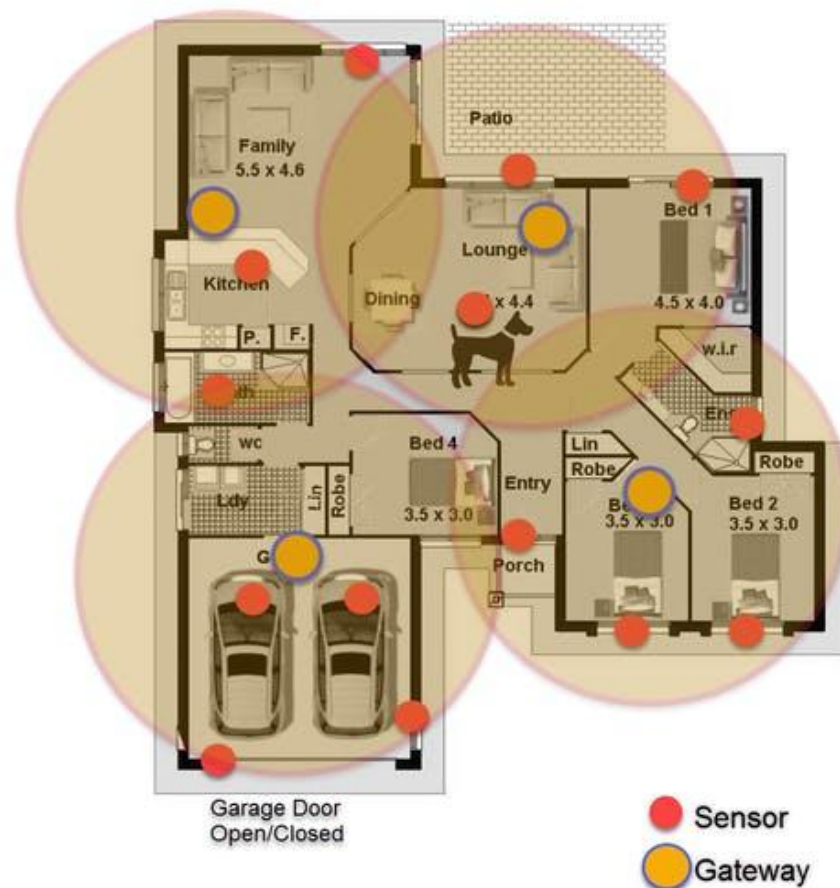
BLE-WiFi MQTT Gateways (variations of gateway using different BLE modules)



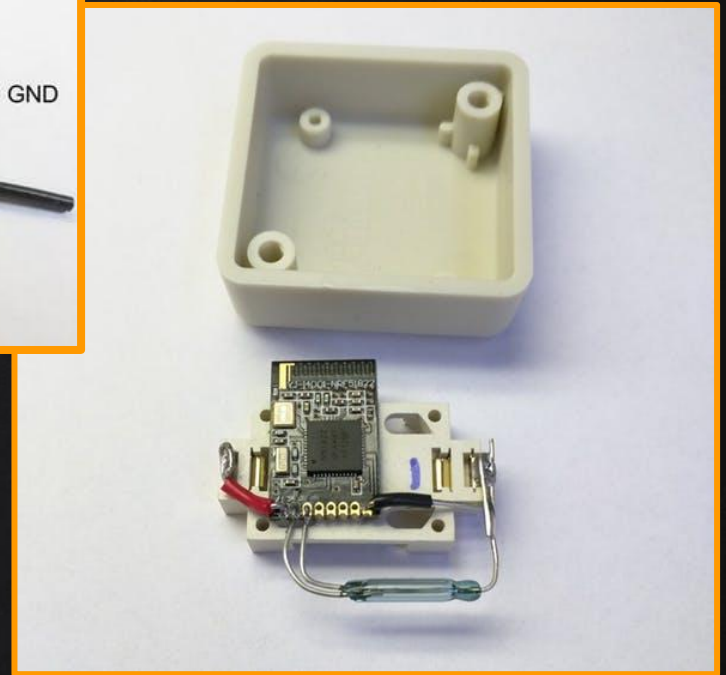
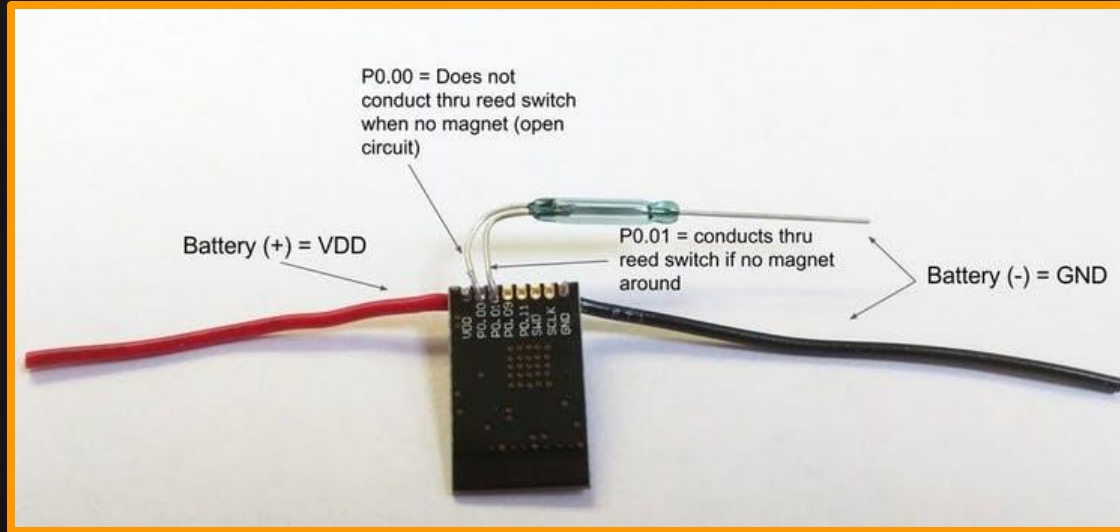




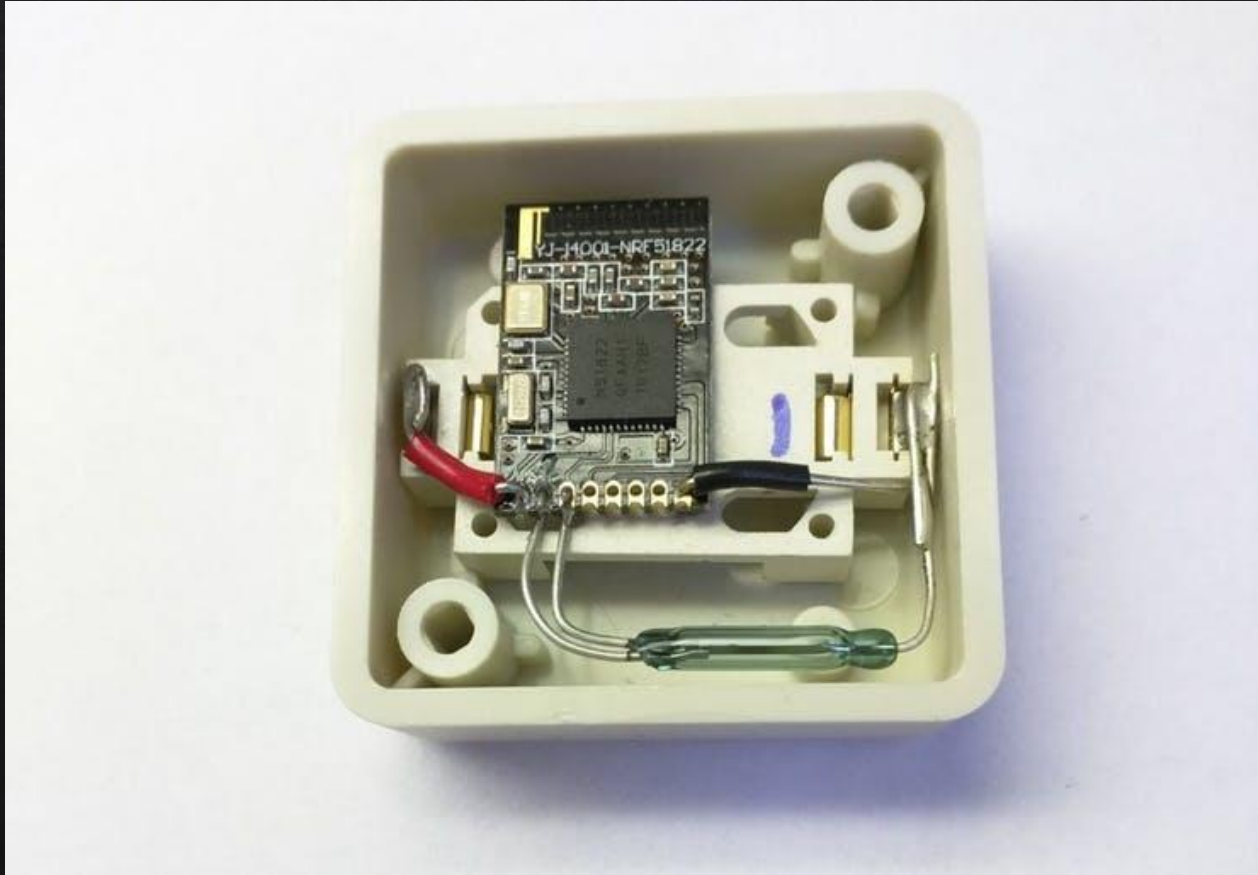




# Easy To Build Devices



# Easy To Build Devices



# Easy BLE firmware creation - ARM mBED online IDE

The screenshot displays the ARM mBED online IDE interface. At the top, the navigation bar includes links for 'arm MBED', 'Mbed OS', 'Mbed Cloud', and 'Partner Portal', along with a search bar. The main navigation menu features 'OS Home', 'Hardware', 'Code', 'Documentation', 'Questions', 'Forum', and a highlighted 'Compiler' button. The user profile 'electronichamsters' is visible in the top right.

The current page shows the repository for 'BLE\_Sensor' by 'Eric Tsai'. The breadcrumb trail is 'Users » electronichamsters » Code » BLE\_Sensor'. The repository description is 'BLE ADV sensor for 2-pin interrupt (i.e. window/door sensor w/ reed switch)'. The dependencies listed are 'BLE\_API', 'mbed', and 'nRF51822'. A horizontal menu below the dependencies includes 'Home', 'History', 'Graph', 'API Documentation', 'Wiki', 'Pull Requests', and 'Admin settings'.

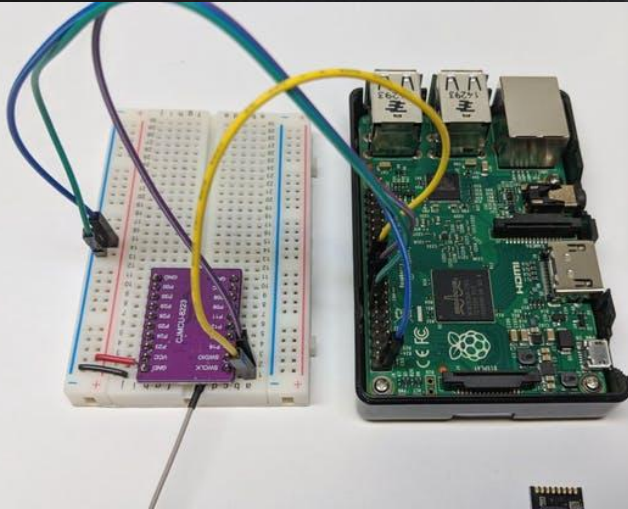
The 'Repository toolbox' on the right side contains three options: 'Import into Compiler' (highlighted with a red circle), 'Import into Compiler' (disabled), and 'Import with mbed CLI'. Below the toolbox, there is a 'Send Pull Request from here' button, a 'Following' status indicator, and an 'Embed url' section with a pre-filled URL: '<<program /users/electronich'.

At the bottom of the page, it states 'Files at revision 12:9bb01e063498' and provides a 'Download repository' link with options for 'zip' and 'gz'.



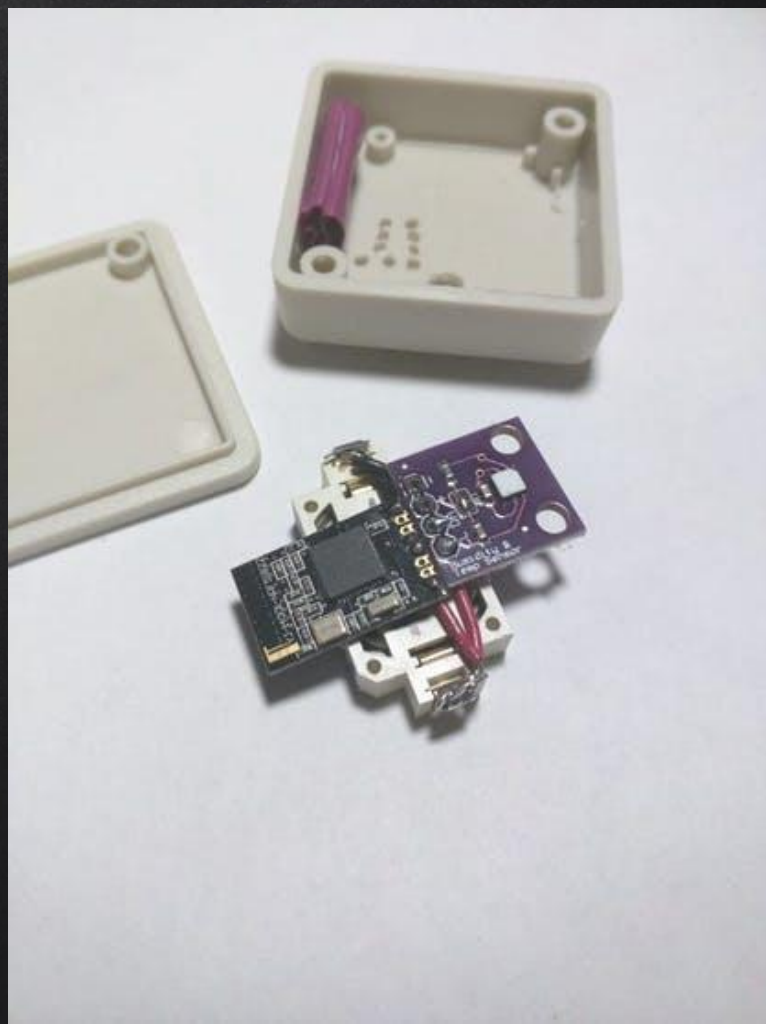
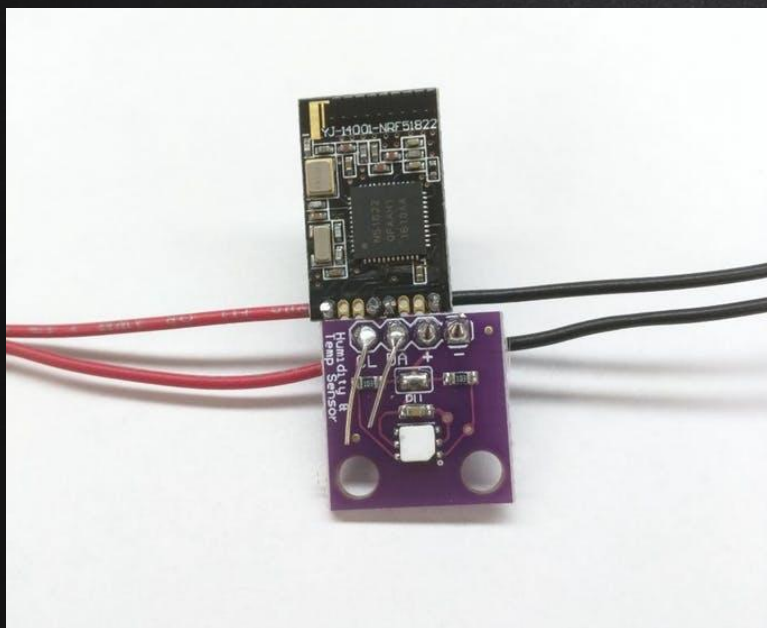
# Easy BLE firmware loading - OpenOCD

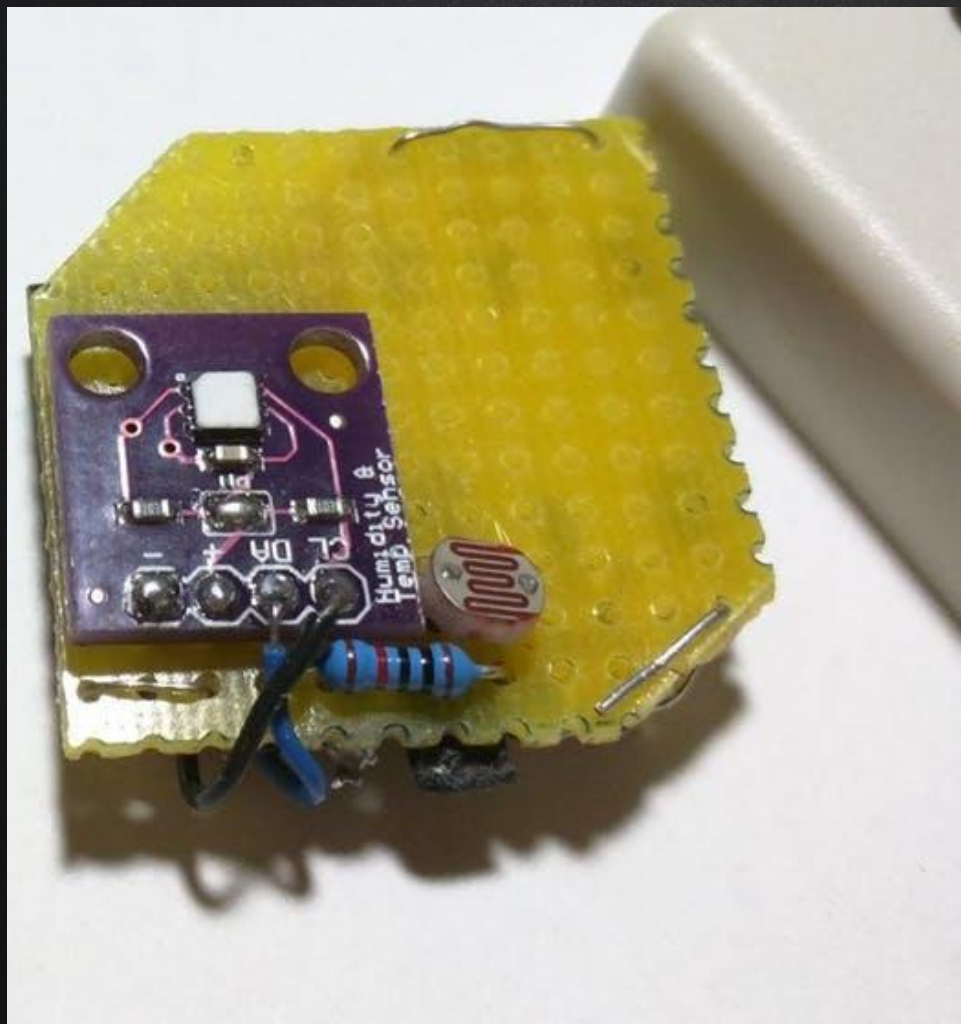
Flashing Firmware	
nRF51822	Raspberry Pi
Vdd	3.3V
GND	GND
SWDIO	Pin 24
SWCLK	Pin 25



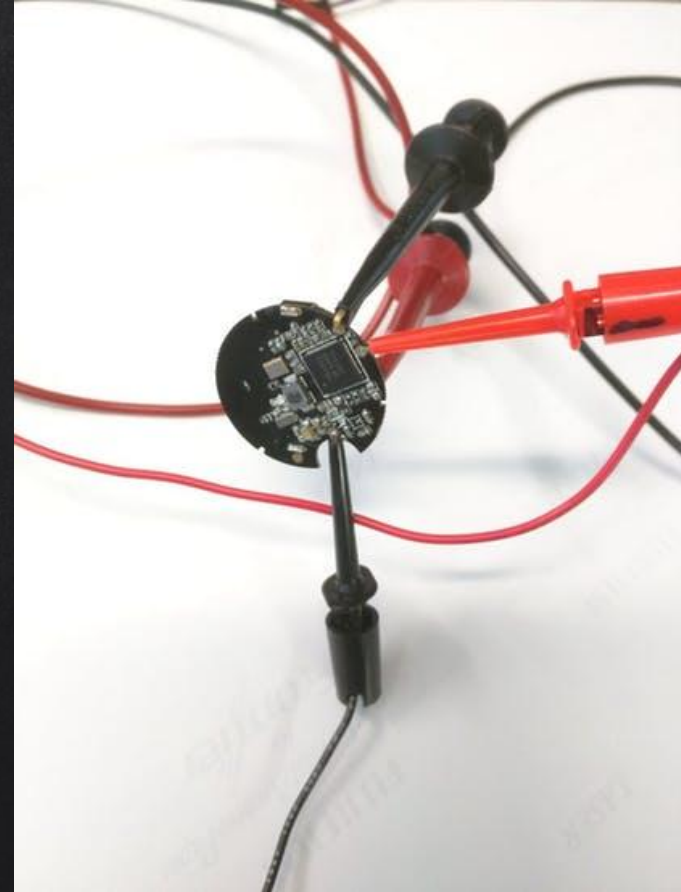
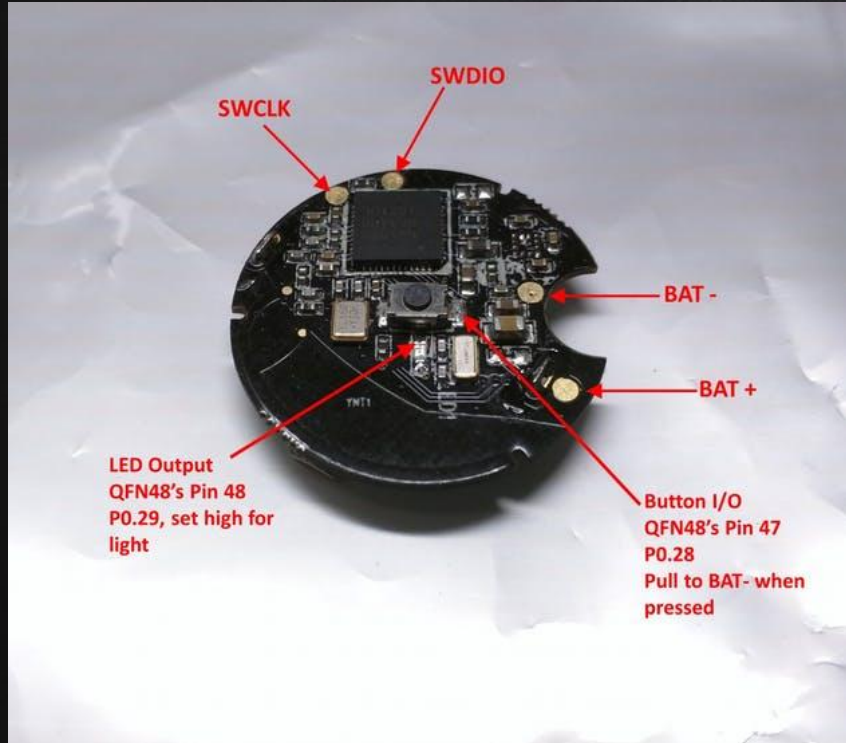
```
pi@raspberrypi:/usr/local/share/openocd/scripts $ telnet 127.0.0.1 4444
Trying 127.0.0.1...
Connected to 127.0.0.1.
Escape character is '^'.
Open On-Chip Debugger
> halt
> nrf51 mass_erase
nRF51822-QFAA(build code: H1) 256kB Flash
> flash write_image erase /media/observer01.hex 0
auto erase enabled
Padding image section 0 with 2112 bytes
Padding image section 1 with 2856 bytes
not enough working area available(requested 32)
no working area available, falling back to slow memory writes
wrote 144384 bytes from file /media/observer01.hex in 12.097040s (11.656 KiB/s)
> reset
nrf51.cpu -- clearing lockup after double fault
target halted due to debug-request, current mode: Handler HardFault
xPSR: 0xc1000003 pc: 0xffffffff msp: 0xffffffd8
Polling target nrf51.cpu failed, trying to reexamine
nrf51.cpu: hardware has 4 breakpoints, 2 watchpoints
```



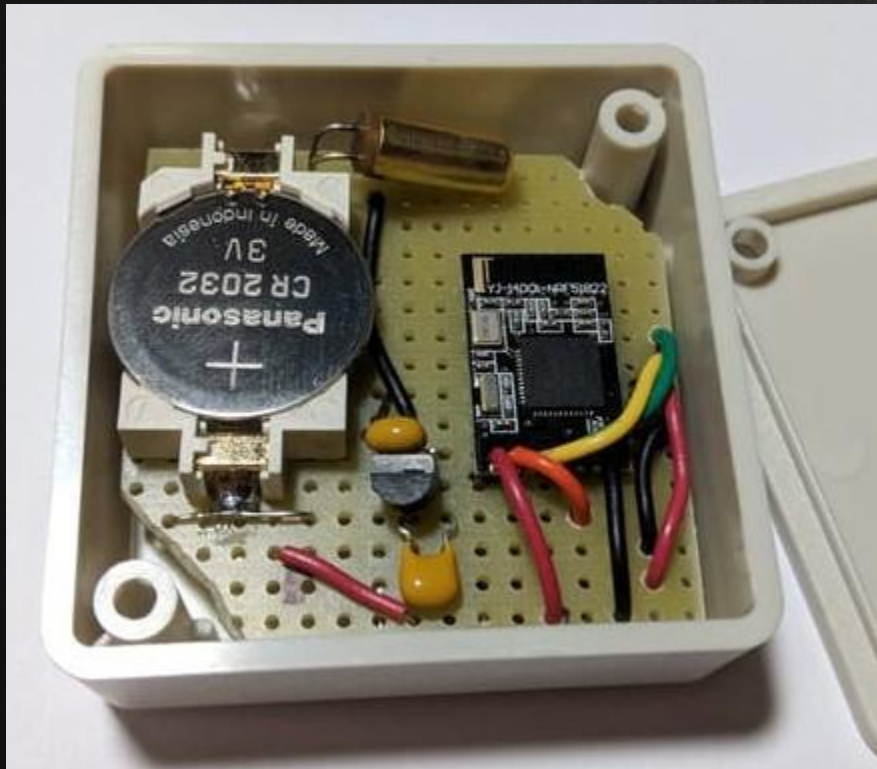




# Dog Beacon



# Dog Food Sensor





Node-RED + Sensors + Servos + Real World Interactions...



# Window Gap Sensor

# LEVERAGE PLATFORMS

- Supply Chain: EBay & Aliexpress
- Wireless Module: nRF51822, ESP8266
- Gateway: Raspberry Pi
- Software:
  - Arduino, mBED, Node-RED, InfluxDB, Grafana, OpenHAB,

# Wifi MQTT ~~Gadget~~ Lightbulb



The image shows an eBay product listing for an "RGB LED Wireless WIFI Control Smart Light Bulb 220V 7W E27". The listing includes a photograph of the light bulb and a smartphone displaying a color control app. A red "go win" watermark is overlaid on the phone. The product details show it is in "New" condition, with a quantity of 1 selected, and 5 available / 112 sold. The price is listed as US \$11.20. There are "Buy It Now" and "Add to cart" buttons. The breadcrumb trail indicates the item is in the "Consumer Electronics > Home Automation > Controls & Touchscreens" category.

Shop by category Search for anything All Categories

Back to search results | Listed in category: Consumer Electronics > Home Automation > Controls & Touchscreens

**RGB LED Wireless WIFI Control Smart Light Bulb 220V 7W E27**

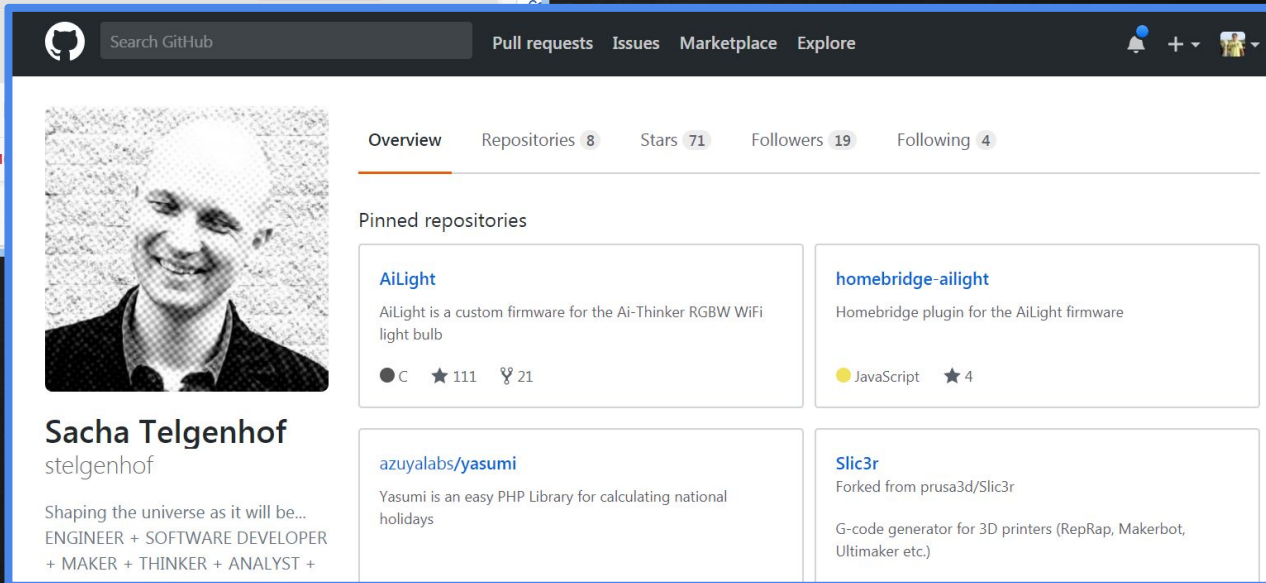
Condition: **New**

Quantity:  5 available / 112 sold

Price: **US \$11.20**

[Buy It Now](#)

[Add to cart](#)



The image shows the GitHub profile page for Sacha Telgenhof. The profile includes a bio, a list of pinned repositories, and statistics. The bio states: "Shaping the universe as it will be... ENGINEER + SOFTWARE DEVELOPER + MAKER + THINKER + ANALYST +". The pinned repositories are:

- AiLight**: AiLight is a custom firmware for the Ai-Thinker RGBW WiFi light bulb. 111 stars, 21 forks.
- homebridge-ailight**: Homebridge plugin for the AiLight firmware. JavaScript, 4 stars.
- azuyalabs/yasumi**: Yasumi is an easy PHP Library for calculating national holidays.
- Slic3r**: Forked from prusa3d/Slic3r. G-code generator for 3D printers (RepRap, Makerbot, Ultimaker etc.).

Search GitHub Pull requests Issues Marketplace Explore

Overview Repositories 8 Stars 71 Followers 19 Following 4

**Sacha Telgenhof**  
telgenhof

Shaping the universe as it will be...  
ENGINEER + SOFTWARE DEVELOPER  
+ MAKER + THINKER + ANALYST +